Asthma and Asthma Related-Symptoms in School Children Living in Rural Tibet

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This work is dedicated to my parents, my brothers and sister

To my dear husband

To the memory of my best friend

Thank you for your love and prayers!

Contents

CHAPTER III RESULTS

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ABBREVIATIONS

WHO World Health Organization

DALY Disability-adjusted Life Years

GINA Global Initiative for Asthma

ISAAC International Study of Asthma and Allergies in Childhood

BHR Bronchial Hyper-responsiveness

TAR Tibet Autonomous Regions

GDP Gross Domestic Product

SPSS Statistical Package for Social Sciences

ABSTRACT

Aim: Asthma is a common chronic condition in both children and adults worldwide and it has a high socio-economic cost. Little is known about asthma in Tibet and especially about asthma in rural and high altitude parts of the country. There is therefore a need to increase the knowledge of asthma and asthma related diseases and symptoms in this part of the world. The aim of my study was therefore to assess prevalence of asthma and asthma related symptoms and diseases among school children in the rural high altitude parts of Tibet. Furthermore, to study environmental exposures and family related conditions and if these conditions were related to disease and symptom occurrence in this population.

Methods: A cross-sectional study was carried out among 2026 children 12 to 14 years of age in two counties Tingri and Sagya in Shigatse District, Tibet. These counties were chosen because they were considered representative for the rural population of Shigatse District and were accessible for our data collection team. The questionnaire consisted of the core questions regarding wheezing, asthma, eczema and rhinitis from the International Study of Asthma and Allergies in Childhood (ISAAC) questionnaire. The core included questions about experience of various symptoms visualized by a video. Data on environmental exposures and living conditions was collected and the participants' height and weight were measured.

Results: Knowledge about asthma was reported by 4.2% of the children (1.4% in Tingri, 6.9% in Sagya, $p<0.01$). The prevalence of asthma, hay fever, rhinitis and eczema were 2.4%, 5.8%, 8.7% and 9.1%, respectively. 6.8% of children reported ever wheezing or whistling in the chest, while wheezing during the past 12 months was reported by 2.6% of the children. The symptom was reported less often among girls than boys ($p=0.01$). The over all prevalence of the symptoms visualized by video was 2.8% for wheeze at rest and 1.1% for wheeze at rest during the last 12 months. 3.4 % of the mothers and 35.3% of the fathers were current smokers and similar percentages were reported for former smoking habits. Most of the families used wood and yak and/or sheep dung for fuel when cooking and heating. In 65.3% of the homes they kept dogs inside. This was more common in Tingri than Sagya ($p<0.01$). There was a statistically significant association between mothers smoking and severe asthma (OR, 5.0; 95%CI, 1.7 to 14.7). There was also a clear

relation between reports of indoor dampness and/or mold problems and the prevalence of asthma symptoms. This included symptoms like wheeze at rest (adjusted OR, 2.2; 95% CI, 1.3 to 3.8), night waking with wheeze (adjusted OR, 2.0; 95% CI, 1.1 to 3.9), night waking with cough (adjusted OR, 2.0; 95% CI, 1.3 to 3.3) and severe wheeze (adjusted OR, 2.6; 95% CI, 1.3 to 5.5). Children from large families had more asthma symptoms than children from small families.

***Conclusions*:** Compared with most western countries Tibetan children living in a rural district reported fewer symptoms of asthma and asthma related diseases. The symptoms and disease occurrence are more similar to findings from countries such as India, China and Russia. The present findings are therefore in accordance with the general view that the western lifestyle in some way increases the risk of developing these diseases. The cause of this is not understood, and the study could not add much to the understanding of that research question. The data did not support the hypothesis that large families or having many siblings have a protective effect on the development of these diseases. However, in accordance with many other studies, I found that indoor dampness/molds increase the risk of having asthma symptoms. The level of exposure to indoor pollutants from the burning of biomasses was high for most of the children. Due to the small variation in this exposure it is unlikely that I should have been able to show that methods of heating and cooking were related to the disease and symptom outcomes. However, it is interesting that a population with heavily exposed children still has low symptom prevalence. I would recommend that several issues from the present study should be investigated in more detail.

Key words: Asthma, childhood, ISAAC, lifestyle, environmental exposure

CHAPTER I

INTRODUCTION / BACKGROUND

I. Introduction / Background

Asthma is a chronic inflammatory disease of the airways. The disease seems to have been on the rise practically everywhere in the world with increasing rates in all age group and particularly in children (WHO, 2000). World Health Organization (WHO) believes asthma is the most common disease in children (WHO, 1998). Asthma and allergies are a major public health problem, and causes of the diseases and the reported increase is mainly unknown (Mutius EV, 2000).

1. The definition of asthma

Asthma is a condition marked by repeated attacks of wheezing in which the air way narrows due to bronchoconstriction, edema of the mucosa, and mucus in the lumen of the bronchi and bronchioles; a disorder of tracheobronchial tree characterized by mild to severe obstruction to airflow in which the symptoms may vary from coughing to dyspnea, and are generally episodic or paroxysmal, by may be persistent (Kishore J, 2002) This is a theoretical definition of asthma unsuited for assessing population prevalence. The assessment of asthma prevalence has to be based on information about persons who have been diagnosed as having asthma or by reports of symptoms of asthma. Typical symptoms of asthma include wheezing, coughing, feeling of "tightness" in the chest and difficulty breathing. Symptoms can vary greatly within a person and from person to person. It is common that individuals with asthma experience "ups and downs" with symptoms and current treatment of asthma is symptomatic and not curable (Asthma and Schools, 2004).

During an asthma attack, constriction of the airway and swelling and mucus secretion tends to close the smaller airways. The greater the airway limitation, the more difficult it is to keep the airways open. This process can lead to the following symptoms: wheezing; chronic or recurrent cough, which gets worse particularly during the night and in the early hours of the morning; pain or a tight feeling in the chest; shortness of breath; flaring of the nostrils when breathing; interrupted talking and hyperinflation appearance of hunched shoulders, hunching forward or preferring not to lie down (Health Scout-Health Library, 2004).

Allergy is an overreaction by the body's immune system to a specific substance called an allergen. An allergic reaction occurs only in persons sensitive to particular allergens. Allergen exposure is a common trigger of asthmatic attacks especially in children (Wang J, 2005). Asthma is closely related to allergic rhinitis and atopic eczema and the conditions are often studied together.

2. Problem statement

Numerous studies have reported increases in the prevalence of asthma and other allergic conditions (allergic rhinitis and eczema) (Mutius EV, 2000). These diseases are among the most common chronic conditions in children and adults worldwide and bring significant direct and indirect costs to societies (Masoli M, 2003). Recently, the burden of diseases in human populations has been measured in disability-adjusted life years (DALY). The DALY approach is grounded on economic and ethical principles and can guide policies towards more cost-principles and development of equitable health care (GINA new report, 2003). Asthma has been estimated to be responsible for over two per cent of all DALY (Åberg N, 1995). In addition, asthma was the 25th leading cause of lost DALY in the world in 2001, HIV/AIDS was 3rd and Alzheimer's was 28th (Mcglaun S, 2003).

According to WHO there were about 155 million people all over the world who suffered from asthma in 1998. The "2003 World Asthma Day" reported 300 millions people of all ages, and all ethnic backgrounds, that suffer from asthma and the burden of this disease is increasing for governments, health care systems, families, and patients all over the world (GINA new report, 2003). In the period 1985 to 1987 the asthma death rates varied from 2 per 100,000 in Hong Kong and USA, to 7 per 100,000 in New Zealand, and to more than 9 per 100,000 in Germany, although the rates for disadvantaged groups were much higher in all countries. These deaths occurred mainly in the young, and a substantial part of the deaths occurred in the patient's home (50-60% of cases) due to incorrect judgment of the severity, and under treatment of the asthma attack (Ait-Khaled N, 2001). Asthma is also one of the most frequently reported causes of disability and missed school days in children and is the leading cause of hospitalization in children in the world (IUATLD, 2004).

Prevalence studies of asthma have to be based on assessment of asthma diagnoses or symptoms. Such information should preferably be standardized in order to be able to compare between studies. In responses to this need, the International Study of Asthma and Allergies in Childhood (ISAAC) was formed in 1991 to facilitate research into asthma, allergic rhinitis and eczema by promoting a standardized methodology. ISAAC developed from a merging of two multinational collaborative projects each investigating variations in childhood asthma at the population level. ISAAC is a unique project, which has attracted worldwide interest and unprecedented large-scale participation. ISAAC Phase One used simple methods for measuring the prevalence of childhood asthma, allergic rhinitis and atopic eczema for international comparisons, suitable for different geographical locations and languages. The aims of ISAAC Phase One were: 1) to describe the prevalence and severity of asthma, rhinitis and eczema in children and to make comparisons within and between countries; 2) to obtain baseline measures for assessment of future trends in the prevalence and severity of these diseases; and 3) to provide a framework for further aetiological research into lifestyle, environmental, genetic and medical care factors affecting these diseases (ISAAC, 2003).

Asthma in the western world

Asthma is common in developed countries. It is estimated that 2–15% of the European population suffers from asthma, and that, in some countries, allergy may affect over 50% of children (Bousquet J, 2004). Moreover, the prevalence of allergic diseases and asthma has actually increased during the past three to four decades (Bousquet J, 2004). Around 15% of all childhood admissions for respiratory disease are due to doctor-diagnosed asthma (ISAAC Steering Committee, 1998). A study showed that the mortality rate from asthma in western countries varies between one and five per 100,000, leading to some 60,000 deaths annually, many of which occur in young people and are preventable (Hassan MR, 2002).

The prevalence of symptoms of asthma, allergic rhinitis, and atopic eczema in children in the United Kingdom ranks among the highest in the world. The evidence from most repeat surveys is that prevalence has increased over the past three decades, but the most recent of

these studies observed that from 1991 to 1998 the increase was confined to milder symptoms of asthma (Anderson HR, 2004). British children are almost twice as likely to have asthma as children in other European Union countries. The estimated rate of asthma among British youth is now six times as high as it was 25 years ago. Overall, asthma kills 1,500 Britons a year (Russell G, 1998).

From Ireland the prevalence rates for wheeze, eczema and rhinitis were 17.4%, 11.2% and 20.2% respectively, with 2.4% of children reported to be suffering from all 3 conditions (Harty SB, 2003).

A study from Oslo, Norway showed an increase in lifetime prevalence of physician-diagnosed childhood asthma (age 0-14 yrs) from 3.4% in 1991 to 9.3% in 1994. The study also reported a corresponding increase in the use of asthma medication from 1.1% to 4.7% (Jonasson G, 2000).

In Australia, asthma is the most widespread chronic health problem. One in four primary school children and one in seven teenagers currently suffer from asthma. Asthma is the most common cause of hospital admissions for children between the ages of five and fourteen and is a major cause of school absenteeism. In childhood, the prevalence is higher in boys than in girls but by adult life this becomes relatively even (Australian Government Initiative, 2005).

In USA, asthma is the third leading cause of hospitalization among children under the age of 15 and it is the first-ranking chronic condition. In addition, it was estimated that 150,000 children are hospitalized annually because of asthma and almost 5,000 children die from their condition. Furthermore, asthma accounts for 14 million lost schooldays annually and estimated annual cost of treating asthma in those less than 18 years of age is $3.2 billion a year (Pordage P, 2003).

Asthma in the nonwestern part of the world

From country to country within Asia, and within each country, the prevalence of asthma varies significantly. The self-reported wheezing rate is high in Hong Kong, Japan and

Thailand (12.4%, 13.4% and 13.0% respectively) while the rate is low rate in China and Indonesia (4.2% and 2.1% respectively) (ISAAC Steering Committee, 1998).

Asian scientists suggest that the Western lifestyle, that of the English-speaking societies, may be important in explaining why asthma is becoming more prevalence. While there is a consensus that the rise in asthma is linked to "Westernization" or "urbanization," no one knows exactly why (Ellwood P, 2001).

Asthma in populations living in the vicinity of Tibet

A study reported that the prevalence of “severe asthma” among Nepalese was 7.3% (aged 11-17 years). Severe asthma was in this study defined as at least one of the following: Speech limitation to 1-2 words at a time between breaths due to wheeze the last year or >12 wheezing episodes last year. The prevalence tended to be higher in peri-urban population. Boys had significantly higher prevalence than girls in the urban but not in the peri-urban population. Furthermore, there were significant differences between the ethnic groups, with the Tibeto-Burmese groups having less asthma (Hessen JO, 2003).

In India, the prevalence of asthma among rural children (1-15 years of age) was found to be 2.6% in 2002. A study carried out in Patna in 1966, reported that the prevalence of asthma in children below nine years was 0.2%, while in a recent study among Delhi school children the prevalence of asthma was 11.9% (Singh D, 2002). The authors suggested that the high prevalence could be due to allergens or urban pollution affecting susceptible children.

China is the highest populated country in the world. Few studies, however, have addressed the prevalence and risk factors for childhood asthma in China. It is estimated that there are 20 million asthma patients in China. The childhood asthma prevalence rate is estimated to be 1.5% in the whole country (Chinese News Center, 2002). The prevalence of childhood asthma (age 0-14) was reported to be 4.3% in the Chengdu urban area in 2000. Compared with a study conducted 10 years ago in the whole Sichuan Province which included the city of Chengdu, it seemed that the prevalence of childhood asthma in Chengdu had increased (2%) (Chinese News Center, 2002). Chengdu is situated

in inland China and not far from the Tibetan border.

Asthma in Tibet

A study on asthma among 0-14 year old children was carried out in Lhasa, the capital of Tibet in 2000. The asthma prevalence was reported to be 0.5%, but there is little information available on methods applied (Chen YZ, 2003). In 2002 a new study based on the methodology of the ISAAC was conducted in Lhasa, Tibet. The aim of the study was to estimate the prevalence of childhood asthma in the city. Results of this study are not yet published and it has not been possible to obtain more information about the occurrence of asthma in Tibet. The current knowledge of the occurrence of asthma as well as other allergy related disease including allergic rhinitis and atopic eczema is thus very limited.

3. Causes of asthma/allergy

To explain the seemingly rapid rise of asthma and allergy around the world is one of great challenges for modern medicine. In the past, various theories were put forward including diesel fuel exhaust, allergies, diet, smoking, passive smoking, physical exercise and some unknown factors related to the western lifestyle. Today, the scientific community seems to agree that a combination of genetic and environmental factors is responsible for the onset of the asthma and allergy (World Asthma Day, 2000).

Factors related to the development of asthma or the triggering of asthma attack or symptoms

Allergy is the most important predisposing factor in asthma and allergic rhinitis. It is reflected in the tendency to produce abnormally high levels of immunoglobulin E (IgE) in response to exposures to substances in the environment (Ait-Khaled N, 1996). Allergy could be caused by genetic predisposition, but could also be a result of environmental exposure. It has been difficult to decipher genetic and environmental effects, but the genetic effect is an important factor for development of allergy and asthma (Nystad W,

2005). It is also well known that inhalant antigens such as pollen, animal dander, house dust mite faeces, are important triggers for symptoms of asthma and allergic rhinitis in asthmatic individuals (Warner JO, 2004). It is however less well known whether such exposure causes development of asthma in non-asthmatic persons. Some children develop 'food intolerance'. The most common allergens are nuts, eggs, orange squash, and milk. However, the link to asthma is not well understood but there are reports that link different nutritional factors to asthma (Romieu I, 2004).

Environmental exposures:

Viral infections: Lower and upper respiratory tract infections are major triggers of symptoms of asthma (Leffert F, 1980). It is less well understood whether infections cause asthma and it is debatable whether early life infections protect against or enhance the development of asthma.

Air pollution: One of the ISAAC studies showed that regions such as China and Eastern Europe, with some of the highest degrees of air pollutants such as particulate matter and sulphur dioxide, generally had low asthma prevalences, whereas western Europe and the USA with high degrees of air pollutants such as ozone, had intermediate prevalences of asthma, and some centers with the lowest degrees of air pollution, such as New Zealand, had a high prevalence of asthma (ISAAC Steering Committee, 1998). The link between asthma cases and air pollution is still unclear.

Environmental Tobacco smoking: There have been numerous claims that exposure to environmental tobacco smoke in children may induce asthma or increase the frequency or severity of attacks in asthmatic subjects. A study found that tobacco smoke exposure was more strongly related to acute manifestations of asthma such as wheezing episodes than with indicators of underlying susceptibility such as bronchial hyper-responsiveness (BHR) (Cook DG, 1998). Another study showed that the incidence and recurrence of wheezing illness in early life is increased if there is smoking in the household, particularly by the mother, whereas the incidence of asthma during the school years is less strongly affected by parental smoking (Strachan DP, 1998).

Indoor exposures: Several indicators of indoor air exposure have also been suggested as

potential risk factors. This includes for instance exposure to cockroaches, mold, mildew, dampness, water leakages, endotoxins, glucans, emission from wood burning, and emission from different building materials. Some studies have shown associations between such exposures and asthma-related health outcomes, but the mechanism behind these associations are still poorly understood (Thomas AE, 1997).

Physical stimuli: Weather conditions and particular changes in the weather conditions like mist and decrease in temperature have frequently been suggested to cause asthma symptoms (Röder I, 2000).

Other exposures:

Body weight, physical activity and dietary intake: The suggested relation between western life style and asthma has raised hypothesis that overweight, physical inactivity, and changes in diet may be of importance. In some western countries, the increased diagnosis of asthma in children has been accompanied by a similar increase in the prevalence of obesity (Romieu I, 2004). Otherwise, a case-control study on childhood asthma in Saudi Arabia found a strong protective effect for vegetable consumption and Vitamin E intake (Farchi S, 2003). In addition, similarly to emotional behaviors, physical activity causes narrowing of the airways, and therefore may provoke asthma reactions (Strauss RH, 1977).

Emotional stress: Emotional behaviors, such as crying or laughing, may cause changes in the breathing pattern, which consequently triggers the bronchi and aggravates asthma symptoms (Weinstein AG, 1984). In addition, emotions such as anxiety may result in over breathing, which could lead to bronchoconstriction due to cooling of the airways (Clark PS, 1982).

The "Hygiene Hypothesis":

A hygiene hypothesis that states that exposure to allergens in the environment early in life reduces the risk of developing allergies by boosting immune system activity. Conversely, relatively clean environment in early life would sway the immune system towards allergy-promoting responses (Sheiel WC, 2003).

Improved living standards in the developed world have led to a marked fall in infectious diseases. In the developing world infectious disease remains a significant cause of morbidity and mortality, but the impact of infection diseases on asthma and allergies are not well known (Kearney PJ, 1998). A recent matched case-control study from Sao Paulo, Brazil, showed that crowding (defined as four or more persons sharing the child's bedroom) was associated with a decreased incidence of asthma diagnoses but an increased incidence of lower respiratory tract infections in children aged 2 to 59 months. Most of adolescent boys in Pelotas, Brazil, crowding and living with other children in early childhood were inversely associated with asthma (Ramsey CD, 2004). The high rates of respiratory infections, tuberculosis, measles and helminths infections in Bangladeshi children might thus contribute to lower rates of allergy. The hygiene hypothesis may at least in part explain the lower prevalence of asthma observed in Bangladesh as compared to developed countries. However, there is conflicting evidence whether early infections may enhance or decrease the risk of developing asthma (Braun- Fahrländer C, 2002).

4. Local conditions in Tibet

4.1 Background on Tibet Autonomous Regions (TAR)

4.1.1 Geography

TAR is located in southwest China and borders Xinjiang Uygur Autonomous Region and Qinghai, Sichuan and Yunnan Provinces. In the south and west, it borders Myanmar, India, Bhutan, Sikkim, Nepal and Kashmir (Zhong ZW, 2001). Consisting of the main part of the Qinghai-Tibet Plateau, TAR has an average elevation of more than 4,000 meters. It has an area of 1.22 million square kilometers and less than 2.1 people per square kilometer. Mt. Everest (Qomolangma) on the border between Tibet and Nepal is 8,850 meters tall, the highest peak in the world (General Introduction of Tibet, 2004).

4.1.2 Population and demographic characteristics

The Fifth National Population Census in 2000 reported a population of 2.62 million in Tibet, including 2.41 million Tibetan, 155,300 Han Chinese, and 49,900 from other ethnic groups (General Introduction of Tibet, 2004). According to the 1990 and 2000 censuses,

the education structure of Tibet's population have been changing, with an increase in the number of people with higher education and a decrease in the number of illiterates and semi-illiterates. The illiterate rate was 44.4% in 1990 but 32.5% in 2000. In 2000, the enrollment rate of school-age children was 85.8%, which was the lowest in China. The educational level of females was lower than males (Tibetan population, 2001).

4.1.3 Map of Tibet (Map of Tibet, 2005)

4.1.4 Economy

The Tibetan economy has developed in recent years. In 2000, the gross domestic product (GDP) was 11.746 billion Yuan (in US $1.43 billion), the total gross output value of industry and farming, forestry, animal husbandry and fishery was 6.95 billion Yuan (in US

$0.85 billion), and the per capita GDP 4,559 Yuan (in US $556). The total value of imports and exports in Tibet in 2000 reached 130.29 million US dollars. At present, farming and animal husbandry are the major industries in Tibet. The industrial sector is quite small in size and diversity. In comparison with inland provinces, and coastal regions of China, Tibet remains an underdeveloped region, where there are still 210,000 people living in poverty (Tibet's economy surges in 2002, 2003).

4.1.5 Health services

The geographic spread of the population of Tibet is one of the key difficulties. The residents are widely scattered in 74 counties, with much of the population still very difficult to reach. To meet this challenge, the region has close to 11,000 health workers, which is a relatively high proportion compared with the rest of China, and roughly equal to 10% of all government employees in Tibet, according to TAR officials. Tibet has three "large" hospitals. In addition, each prefecture has at least one hospital and one Tibetan traditional medicine-based medical center. Some 80% of townships have small clinics, and the Region has 3,600 "barefoot doctors" to reach out into the hinterlands, although authorities admit that it is difficult to arrange for training and salaries for the personnel in some sparsely populated areas, meaning that many of them exist in name only (U.S. Embassy Beijing, 2000).

Because of the improvement in socioeconomic conditions and the educational status, many of the local diseases, epidemics and fatal diseases, which used to be serious threats to people's lives and property are now under control. The inoculation rate for children has exceeded 85 percent. Mortality at all ages in Tibet was much higher than the national average. The death rates in each age group in rural areas are higher than those in urban areas. In addition, the infant mortality rate is still high (35.3 per 1,000 in the year 2000) (Tibet social life, 2001).

4.1.6 School system

A majority of children go to school at the age of 7 years in Tibet. The children from the

rural areas usually start later than children in the city or urban areas.

The primary education in Tibet is the six-year *lobchung*. There are two types of *lobchung*: the *mangtsug* and *zhungtsug* schools. The *mangtsug* schools are set up by local people at the village level and receive no financial and facilitative support of any kind from the Chinese government. The *zhungtsug* schools are primary schools, established by the Chinese government. They are found in the cities and county headquarter towns and serves the urban population that consists primarily of Chinese settlers. The students who complete *lobchung* schooling then have a chance to enter a *loading* - a six-year middle school. The *loading* is divided into lower middle school and higher middle school, each of three years duration, and middle school students must choose to follow either a science or arts stream (Garfunkel J, 1999).

4.2 Local lifestyle and environmental conditions that might be of importance for asthma/allergy

Lifestyle conditions and environmental exposures in Tibet, and particularly in rural Tibet, differ from those seen in well-developed western societies. These conditions could therefore prove to be similar to the conditions speculated to be protective against asthma and allergy according to the hygiene hypothesis.

Indoor exposure to dust, smoke and particles:
Exposure to dust and particles indoors is probably substantial due to heating and cooking routines and restrictions in ventilation due to the rough climate. The climate also enhances staying indoors, which makes indoor exposure a relatively more important source of exposure than outdoors. The use of wood and unprocessed biomass fuel such as yak and sheep dung for heating and cooking might cause substantial particle exposure. Another source of indoor exposure is tobacco smoking. Besides exposure of the smoker's lungs, tobacco smokes results in environmental passive smoking by persons living in the same environments as the smoker. Furthermore, young children are often carried on their mothers' or sisters' backs while cooking. The Tibetan lifestyle with much indoor living and restricted ventilation might create a situation where indoor smoking might result in substantial environmental tobacco smoke exposure. In TAR, due to religion and culture,

women cannot smoke, especially during pregnancy. However, the prevalence of smoking is not scientifically assessed, but is believed to be quite high.

Out door air pollution:

There are no industry sites in rural areas in TAR and rural people, at least, do not have to worry about industrial pollution. Furthermore, rural people are seldom exposed to exhaust from vehicles, while this might be the case in larger cities like Lhasa. Sand dust is a common problem, especially in rural areas, because of windy weather.

House dust mites, mold, fungi and cockroaches:

Asthma is in part an allergic disease. It is known that house dust mite exposure is related to allergy and asthma symptoms in sensitive individuals, and there are some indications that this is the case for exposure to mold, fungi and cockroaches (Jaakkola JJ, 2005). It is unknown to what how common these exposures are in Tibet. The outdoor climate is not favorable but indoor conditions could still be. Problems with molds can arise when a room or house has a moisture problem, such as leaks, moisture intrusion, or from consistently high indoor relative humidity. Moisture control is the key to prevent mold problems.

Physical activity:

In the primary and middle school, physical exercise lessons are arranged regularly, usually once a week. In addition, students residing in school need to join morning running, which takes about 30 minutes. After class children use to play games and they become sweat or they get out of breath.

Diet:

The role of diet in asthma has also been investigated. A Japanese study has for instance found an association between a high intake of fish and a lower incidence of asthma. But the effect of fish on asthma is a controversial issue (Takemura Y, 2002). However, Tibetans in rural areas of Tibet never eat fish. Another study reported a protective effect for vegetable and fresh fruit consumption and a negative effect for butter and margarine use on wheezing symptoms among children (Farchi S, 2003). Furthermore, a study also showed that intake of fruits with high vitamin C content was related to a decrease in the risk of wheezing and lower pulmonary functions among children. Vitamin C is a major

antioxidant present in the airway surface liquid of the lung (Romieu I, 2004). The Tibetan children in rural areas have low intakes of vegetables and fruits and vitamin C. Potatoes, radishes and cabbages play a main role in their diet. Otherwise, there have some traditional food, such as yak meat and lamb and tsamba (one kind of wheat). These nutritional habits' effects on asthma have never been studied. Whether breast-feeding reduces the risk of asthma and other allergic diseases among children remain controversial. There are studies suggesting that breast-feeding decreases the risk of asthma and allergic diseases (Kull I, 2004). The breast-feeding is practiced extensively in Tibet, especially in rural areas.

Pets and domestic animal:

The relation between asthma and allergy and exposure to furred pets is a subject of controversy (Svanes C, 2003). Some studies considered pet exposure to be a risk factor for asthma and allergic diseases. On the other hand, in more recent studies there is some evidence that early contact with pets, particularly cats or dogs, might be a protective factor for allergies (Hölscher B, 2002). In Tibet a large proportion of the population are peasants and as in many other developing countries, there is a tradition of keeping cattle inside the house. It is believed that in rural areas every family has domestic animals such as cows, chickens, horses, donkeys and bulls, and they are always in direct contact with them. The dog is present for protecting family members and house and cats for catching mice. But they are not considered to be pets. People living in rural areas often have poultry and farm animals in the house.

5. Research objectives

This study was done as a part of an initiative to increase the knowledge and understanding of respiratory physiology, respiratory health, and respiratory diseases in Tibet.

The aim of the current project is to estimate the prevalence of asthma among school children aged 12-14 years in a rural high altitude area of Tibet (approximately 4,300 meters). Furthermore, to estimate the prevalence of well-known and suggested risk factors for asthma. Finally, the aim is to investigate associations between these factors and asthma. In addition, descriptive information on allergic rhinitis and eczema is provided, as

these diseases are closely related to asthma and to each other.

The results of the study will be utilized for the purpose of increasing the awareness of asthma and its public health consequences and to give basic information about the disease for further epidemiological investigation. Systematic knowledge of children's environmental exposure and living conditions is mainly nonexistent in Tibet. The study could thus also contribute to descriptions of school children's living conditions in rural Tibet.

CHAPTER II

RESEARCH METHODOLOGY

II. Research Methodology

1. Study design

A cross-sectional study was carried out among 2026 children 12 to 14 years of age in Shigatse District of Tibet. The study was carried out in 22 primary schools out of 25 and the only two lower middle schools in the District.

2. Study district

Shigatse District is one of Tibet's five districts. It is located in the southern part of the country with borders to Nepal, Bhutan and Sikkim. The district covers 176,000 square kilometers and the altitude varies between 3,200 and 4,600 meters above sea level. The largest part of the district is above 4,000 meters. The population is estimated to be 647,400, 25% of the total population of TAR, and Tibetans is about 95% of which 91.1% are farmers. The population consists mainly of Tibetans, but some Han Chinese live in the urban areas. Shigatse is the main city of the district. The rest of districts, including the study areas, are mainly rural areas with some small villages. Population density is 3.3 people per square kilometer (Secondary City---Shigatse, 2004).

In 1994, the average annual income per capita was 1,019.96 RMB (US dollar: 124.39). Today, most farmers and herdsmen have adequate food and clothing. Almost all families own bicycles, horse carts, watches and pressure cookers, and many families own cassette recorders and solar energy stoves. Half of the families use electric mixers to stir buttered tea and television sets are common (Shigatse City Government Report, 2002).

The Shigatse District diet consists mostly of meat, milks and other high-protein foods. The main food staple is 'Tsamba', Tsamba is made of roasted barley with husks ground with a hand mill into very fine flour, which is mixed with butter, cheese, sugar and a little tea and then rolled into small lumps and eaten with fingers. A selection of food made from wheat flour, rice and vegetables are also used, especially among urban families. Tea is a necessity and both butter tea (a Tibetan specialty) and sweet tea (an imitation of English

tea and Indian tea) is commonly used.

Yak/sheep dung and wood are commonly used as fuel for heating and cooking causing high concentrations of indoor air pollution.

3. Study population

The study was carried of in Tingri and Sagya, two counties of Shigatse District, and restricted to areas situated 3900 meters or more above sea level. These counties were chosen because they were considered representative for the rural population, and accessible for our data collection team.

Tingri County is situated in the south of the Shigatse District on the border of Nepal. Average altitude is 4,300 meters. Approximately 46,000 people are living in the county and almost all of them are Tibetans. Population density is 3.3 people per square kilometer. The whole county has one lower middle school and one primary school in the county center, and 13 primary schools in the villages. The number of 12 to 14 year-old children registered in schools is 3,064 (Tingri Administrative News Office, 2003).

Sakga County is also located in south of the Shigatse District. The average altitude is 4,400 meters and 43,806 people are living there. Tibetans are the main ethnic group in this county and the population density is 5.4 people per square kilometer. The county has one lower middle school and one primary school in the county center and 10 primary schools in the villages. The number of 12 to 14 year-old children registered in schools is 3,956 (Sagya Administrative News Office, 2003).

Data were collected from twenty-two primary schools and the only two middle schools. Three villages in Tingri County were not included, because they were located at an altitude lower than 3,900 meters. According to recommendations in the ISAAC protocol the aim was to include about 2000 children or about 1/3 of the children who attended the selected schools. In order to achieve this and get representative samples of school children from both counties it was decided to recruit about 1000 children from each county and recruit children from all eligible schools. As school size varied, this meant that only a

random sample of children was recruited from schools with more than 90 children 12-14 years of age. In these schools data collection was restricted to the number of classes necessary to invite around 90 children. In total 2026 school chidren were included in the study (1001 from Tingr and 1025 from Sagya).

4. Data collection

All children answered a written questionnaire and in addition the students were shown a video describing symptom of asthma, and while watching this, they answered questions related to the video. Furthermore, height and weight was measured and the person measuring height also registered if the child suffered from big bone disease (Karsin Beck disease), chicken pox, ultraviolet radiation, and herpes simplex and pollen or grass allergy.

Field workers and training of field workers:
Data were collect by two well educated and trained research assistants with experience in working for the Medical Faculty Tibet University and the Center for Disease Control and Prevention in Lhasa. They were additionally trained in basic research methods and in all practical aspect related to the current project. This included also training in using equipment such as electric generators and video projectors.

Written questionnaire:
The written questionnaire consisted of the core questions regarding wheezing, asthma, eczema and rhinitis from the ISAAC questionnaire (ISAAC Phase Three, 2004). We reported the answers to selected questions or combinations of selected questions: for asthma: "Have you ever had wheezing or whistling in the chest? Have you had wheezing or whistling in the chest in the past 12 months?"; for allergic rhinitis: "Have you had a problem with sneezing, or a runny, or a blocked nose when you DID NOT have a cold or the flu in the past 12 months? If yes: has this nose problem been accompanied by itchy-watery eyes?"; and for eczema: "Have you ever had an itchy rash which was coming and going for at least 6 months? If yes: Has itchy rash at any time affected any of the following places: the folds of the elbows, behind the knees, in front of the ankles, under the buttocks, or around the neck, ears, or eyes?" The questionnaires for the present study were translated from English to Tibetan language and back to English. The development

of the questionnaire was assisted by Chen Yuzhi. Chen Yuzhi is in charge of ISAAC in China and ensured that the questions used in this study are identical to the questions used in the ISAAC Phase Three study carried out in Lhasa. In addition we got assistance from a teacher from the Tibetan Traditional College. The questionnaire is included as a supplement (Appendix 2).

Video questionnaire:

A video was used to give an audiovisual presentation of asthma symptoms. The video showed five sequences of young persons with different manifestations of asthma (ISAAC Video Questionnaire, 2004). It was strongly recommended by ISAAC to use the video in data collection in this age group. The video elicited information without using written language terms to describe asthma symptoms. Before completing the written questionnaire, the students themselves were shown the video. The questionnaire is included as a supplement (Appendix 2).

Environmental exposures and living conditions questionnaire:

Data on living conditions, environmental exposures and parental smoking were obtained from the children by a self-administered questionnaire. The questionnaire included questions about family size including number of siblings, which in the analyses were categorized in 0, 1, 2, 3, 4 and 5 or more siblings, regular contacts with pets (dogs, cats, birds, rabbits, farm animals) at present and formerly; parental and other smoking; cooking and heating condition including the use of modern sources (electricity, gas, coal and kerosene and petrol) and traditional sources (wood and yak/sheep dung); and details of the aspects of current diet. Dietary factors are not analyzed in detail in this thesis. Yixi Yangzong and Minna Shan who are pediatricians at the First People's Hospital in Lhasa, assisted in developing questions on environmental exposures and living conditions suitable for rural Tibet (Appendix 2).

Height/weight measurements:

To estimate height (to the nearest 1/10 cm) and weight (to the nearest kg), we used an electric scale and a height ruler. The measurements took place after the questionnaires were completed and the results were registered at the end of each student's questionnaire (Appendix 2). Height was measured without shoes and weight with only light clothing. Body Mass Index (BMI) was calculated as weight (kg)/height $(m)^2$.

Data collection procedures:

One month before data collection, a pre-test was carried out in a group of children of the same age. A draft of the questionnaire was tested on 30 students from Gongga county primary school. The respondents were asked to report if any of the questions were unclear. Based on the results of pre-test, changes have been made on the structure of the questionnaire before data collection began.

Data collection was started 7th of September, which was after the rainy season. Twenty-eight days were used for collecting data in Tingri and sixteen days in Sagya.

Data collection was carried out in the classrooms at the children's schools. Two persons from the research team were present all the time. In addition, the local teachers assisted in the practical work. In one case the data collection was carried out in the field, because the pupils were participating in harvesting, including 31 pupils.

Practical approach:

(1) The school leader and the teachers were contacted in advance. The school leader was informed about the purpose of the project and asked if he or she agreed that the research team could collect data at their school during school time. Then, the date of the data collection was decided.

(2) At the day of data collection the school leader according to requirements from the authorities signed that he or she agreed that the school participated in the study (Appendix 1). The eligible students were then divided into two or three groups of 30 to 40 students, dependant on the number of eligible students. Each group went to a classroom. There they were given an introduction about the main objectives of the research project. They were then asked if they would participate in the study and informed that participation was voluntarily.

The study staff showed the video to the groups and explained about asthma and symptoms. Then the questionnaire was handed out and the students were instructed to fill in their answers. Each student returned their questionnaire to a staff member after completing both written and video questions. The questionnaires were checked for completeness.

Standing height, weight, seat height and chest circumference were then measured and added to the questionnaire information from each student.

Three persons participated in the measurements: one from local school physical training office measured weight and circumference, one from the research team measured standing height and seat height. In addition this person also observed the student's skin and joins to check for skin diseases and big bone disease (Kashin-Beck Disease). The third person filled in the measured data. The students took off their jackets before their weight was measured.

5. Data processing

At the end of each day of data collection the questionnaires were registered and given a code number and stored until they were sent by post to Lhasa when the data collection was finished at one area and the team had to move to another area. Two students from the Medical College conducted the data entry using SPSS12.0. Both students had been trained in using the software. Data entry was finished in December 2004.

6. Statistical analysis

All statistical analyses were performed using SPSS 12.0 Statistical Software for WINDOWS. The Frequency analyze, Chi-square test and cross-tabulations were used in the assessment of relations between different groups and variables. P value of <0.05 was chosen as the level of significance and p values presented are two-tailed. Results were stratified by sex and county. Association between asthma symptoms (video) and individual covariates including parents smoking, passive smoking, cooking condition, heating condition, dampness/molds, pets inside the house and number of siblings, was done using univariate logistic regression models. Multivariate logistic regression models were finally used to estimate the association between the each of the asthma symptoms (video) and age, sex, county, father smoking, mother smoking, cooking and heating condition, dampness/molds and pets inside the house (pets including dog, cat, bird, rabbit and other animals). For estimating the effect of number of siblings on asthma, I used the

variable as continuous as well as by grouping sibling number into various categories. Odds ratio (OR) with 95% confidence intervals (95% CI) are presented to indicate the direction and strength of the associations. Similar analyses were carried out for symptoms based on the written questionnaire. However, the result of these analyses was not substantially different form the results based on the symptoms from video questionnaire and association measures (OR) are only presented for the video questionnaire symptoms.

7. Ethical considerations

Official permission to start this study was granted by the Ministry of Education of TAR, the Ministry of Health of TAR and the Office of Frontier Defence in Lhasa. Before any fieldwork, the aims and objectives of the study were explained to the invited students. They were reassured about the confidentiality of data and informed about our research objectives and that they could refuse to participate and withdraw from the study at any time without any consequences for themselves. The Norwegian Ethical Committee for Medical Research also approved the study.

CHAPTER III

RESULTS

III. Results

A total of 2026 children answered the questionnaire and participated in the measurements, program comprising 1001 children from Tingri and 1025 children from Sagya. In Tingri 658 (65.7%) of the participants were boys and 343 girls (34.3%) while in Sagya 652 (64.2%) were boys and 364 (35.8%) girls. In Sagya nine students did not answer the question about gender. More than 95% of the children answered all items of the questionnaire.

1. Reports of diseases and symptoms

Written questionnaire:
Some knowledge about asthma was reported by 4.2% of the children, with 1.4% in Tingri and 6.9% in Sagya ($p<0.01$). The overall prevalence of asthma, hay fever, rhinitis and eczema were 2.4%, 5.8%, 8.7% and 9.1%, respectively. The prevalence was lower in Tingri than in Sagya (1.3%, 3.9%, 5.6% and 4.8% in Tingri vs. 3.5%, 7.6%, 11.8% and 13.3% in Sagya, $p<0.01$).

The prevalence of symptoms of asthma, rhinitis and eczema by gender and county are presented in table 1 and table 2.

Respiratory symptoms of asthma: 6.8% of children reported ever wheezing or whistling in the chest. The lifetime prevalence was significantly lower in girls than boys. Wheezing or whistling in the past 12 months was reported by 2.6% of the children and less often among girls than boys ($p=0.01$). Exercise related wheezy chest was reported by 7.8% of children and 15% of the children have had dry cough at night in the past 12 months apart from cough associated with a cold or infection.

Respiratory symptoms of rhinitis: 30.6% of children reported ever sneezing or runny or blocked nose apart for symptoms associated with cold or 'flu', while 16% of the children reported sneezing or runny or blocked nose in the past 12 months, 18.4% of the girls and 14.7% of the boys ($p=0.03$). The question about nose problem accompanied by itchy-

watery eyes in the past 12 months was reported by 7.7% of the children and there were no gender or district differences.

Eczema: Ever itchy rash coming and going at least six months was reported by 13.9% of the children, while 4.6% of the children had experienced itchy rash in the past 12 months and more often in Tingri than Sagya (5.7% vs. 3.5%, P=0.02).

2. Video questionnaire

Asthma symptoms by gender and county based on answers to the ISAAC video questionnaire is shown in the table 3 and table 4. Ever wheeze at rest was reported by 2.8% of the children, while wheeze at rest during the last 12 months was reported by 1.1%. The table also shows the prevalence of other respiratory symptoms. Boys had a higher prevalence than girls for most of the symptoms and some of the differences reached statistical significance ($p<0.05$). Children from Sagya reported respiratory symptoms more often than their peers from Tingri and some of the differences reached statistical significance. Only 1.4% of the children reported that they had experienced severe wheeze.

3. Environmental exposures and family and personal characteristics

Information was in general collected for both current and former exposures. As it turned out the frequency of previous and current exposures were about the same and only current exposures are presented in most of the tables. The equality in current and former exposure is demonstrated for parental smoking in table 5.

Smoking: Smoking prevalence by county is presented in table 5. 3.4 % of the mothers and 35.3% of the fathers were current smokers and former smoking habits were about the same. Smoking prevalences were not significantly different in Tingri and Sagya. Indoor smoking was somewhat higher in Sagya than in Tingri.

Energy sources for cooking: Energy sources for cooking are described in table 6. Wood and yak/sheep dung for cooking were the most common sources of energy. Wood is used

in 81.6% of the homes, yak/sheep dung in 37.9%. Wood for cooking was more common in Tingri ($p<0.01$) whereas yak/sheep dung was more common in Sagya ($p<0.01$).

Energy sources for heating: Table 7 present sources for domestic heating in the homes of the participating children. Electricity, gas, coal and kerosene or petrol for heating were not commonly used neither in Tingri or Sagya, while wood for heating was used in 86.9% of the homes, and yak/sheep dung in 19.5%.

Pets: Description of keeping pets inside the home by county is shown in table 8. In 65.3% of the homes they kept dogs inside the home and this was more common in Tingri than Sagya ($p<0.01$). Cats were kept inside in 54.9% of the homes and 22.4% keep other animals inside the home. In Tingri 19.8% of the homes were without a pet compared to Sagya where 5.5% of the homes were without pets ($p<0.01$).

Description of pets and farm animal outside the home by county is shown in table 9. Contact with a dog at least once a week outside home was reported by 40.8% of the children. It was more common in Tingri than in Sagya ($p<0.01$). On the contrary, contact with cat at least once a week outside home was more common in Sagya than Tingri ($p<0.01$).

Dampness and molds: Table 10 shows the frequency of indoor dampness/molds by county. Dampness on the walls or ceiling at home was reported by 12.6% of the children while molds on the walls or ceiling were reported by 14.3%. There was no difference between the counties. In addition, dampness/molds were reported by 23.8% and it was more common in Sagya than Tingri ($p<0.01$).

Siblings: Description of number of siblings by county is shown in table 11. Only 3.6% children reported they are only child in the family. Most of children have 1 to 5 siblings, with 1 sibling 13.5%, 2 siblings 18.1%, 3 siblings 18.1%, 4 siblings 14.8% and 5 siblings or more than 5 was 31.7%, respectively. There are no significant differences between Tingri and Sagya.

Weight/height:

Children's average body weight was 32.2 kg (31.7 kg among boys, 33.3 among girls) and there was no significant difference in body weight in children from Tingri and Sagya.

Average standing height was 139.0cm and seat height 72.5cm. Both standing height and seat height were higher in girls than boys.

4. Associations between respiratory symptoms and environmental exposures and characteristics:

Only a selection of associations is presented in this thesis, focusing on the video questionnaire, as it is believed that the results from the video questionnaire show the most valid outcomes. However, parallel analyses of the data from the written questionnaires are also done. These analyses did not show substantially different result concerning the associations with environmental exposures and the other characteristics.

Table 12 shows bivariate associations between respiratory symptoms of asthma and parental smoking and dampness/molds in the house. There was a statistically significant association between maternal smoking and severe asthma (OR, 5.0; 95%CI, 1.7 to 14.7). The symptoms of wheeze at rest, night waking with wheeze and night waking with cough were more prevalent among school children that were exposed to maternal smoking. Paternal smoking and others smoking inside the house had no significant effect on the asthma symptoms, while dampness/molds were associated with wheeze at rest (OR, 2.2; 95%CI, 1.3 to 3.8), night waking with wheeze (OR, 2.0; 95%CI, 1.1 to 3.9), night waking with cough (OR, 2.0; 95%CI, 1.3 to 3.3) and severe wheeze (OR, 2.6; 95%CI, 1.3 to 5.5).

Table 13 shows bivariate associations between cooking and heating conditions and symptoms of asthma among 12-14 year olds school children living in rural Tibet. In the analyses data was categorized in "modern" sources including electricity, gad, coal and kerosene and petrol, "traditional" sources including wood and yak/sheep dung. For all respiratory symptoms of asthma there was no significant relation with source for cooking and heating. There was no clear relationship between being exposed to pets inside the house and symptoms of asthma.

The prevalence of the symptoms of asthma according to number of siblings is shown in table 14. The crude prevalence increased with number of siblings, although no statistically significant dose-response relation between number of siblings and symptoms of asthma

were observed.

Table 15 presents respiratory of symptoms of asthma associated with indoor condition by adjusted odds ratios (OR) and 95% confidence intervals (95%CI) based on the video questionnaire. In addition to control for the studied exposure, it is also controlled for gender, age and county. The adjusted analyses showed that maternal smoking was significantly associated with severe wheeze (OR, 3.7; 95% CI 1.1 to 13.0), but paternal smoking and asthma symptoms were not significantly associated. There was a clear relation between dampness/molds and wheeze at rest (OR, 2.1; 95% CI, 1.2 to 3.7), night waking with wheeze (OR, 2.0; 95% CI, 1.1 to 3.8), night waking with cough (OR, 2.0; 95% CI, 1.2 to 3.3) and severe wheeze (OR, 2.3; 95% CI, 1.0 to 5.2). Pets inside the house and type of cooking and heating were not significantly associated with any of the symptoms of asthma. Similar analyses were performed for the other health outcomes without detecting substantial different associations between outcomes and exposures as shown above (figures not given).

Table 1. Respiratory symptoms, asthma, rhinitis and eczema by gender among 12-14 year old school children living in rural Tibet

	Total (n=2026) %	Girls (n=707) %	Boys (n=1310) %	P-value
Ever wheezing or whistling	6.8	5.0	7.9	0.01
Wheezing or whistling in the past 12 months	2.6	1.3	3.4	0.01
Wheezy chest during or after exercises in the past 12 months	7.8	6.2	8.6	0.05
Dry cough at night in the past 12 months apart from cough associated with a cold or infection	15.0	15.0	15.0	0.94
Ever sneezing or runny or blocked nose when no cold	30.6	30.7	30.5	0.94
Sneezing or runny or blocked nose in the past 12 months when no cold	16.0	18.4	14.7	0.03
Nose problem accompanied itchy-water eyes in the past 12 months	7.7	8.9	7.2	0.16
Ever itchy rash coming and going at least six months	13.9	13.7	14.1	0.82
Itchy rash in the past 12 months	4.6	4.4	4.7	0.73

* There are 9 school children who did not answer the question about gender.

*Missing information varied between 11 and 55 for each of the questions.

Table 2. Respiratory symptoms, asthma, rhinitis and eczema by county among 12-14 year old school children living in rural Tibet

	Total (n=2026)	Tingri (n=1001)	Sagya (n=1025)	P-value
	%	%	%	
Ever wheezing or whistling	6.8	6.0	7.6	0.09
Wheezing or whistling in the past 12 months	2.6	2.0	3.2	0.15
Wheezy chest during or after exercises in the past 12 months	7.8	7.3	8.3	0.37
Dry cough at night in the past 12 months apart from cough associated with a cold or infection	15.0	15.1	14.8	0.86
Ever sneezing or runny or blocked nose when no cold	30.6	32.3	28.9	0.12
Sneezing or runny or blocked nose in the past 12 months when no cold	16.0	17.5	14.5	0.08
Nose problem accompanied itchy-water eyes in the past 12 months	7.7	8.4	7.1	0.3
Ever itchy rash coming and going at least six months	13.9	13.8	14.0	0.76
Itchy rash in the past 12 months	4.6	5.7	3.5	0.02

*Missing information varied between 3 and 54 for each of the questions.

Table 3. Asthma symptoms by gender (ISAAC Video Questionnaire) among 12-14 year old school children living in rural Tibet

	Total (n=2026) %	Girls (n=707) %	Boys (n=1310) %	P-value
Wheeze at rest	2.8	1.6	3.5	0.01
If yes, happened in the past 12 months	1.1	0.4	1.5	0.03
If yes, happened at least once a months	0.8	0.4	1.1	0.13
Wheeze after exercise	4.1	3.8	4.2	0.69
If yes, happened in the past 12 months	1.4	1.1	1.6	0.4
If yes, happened at least once a months	1.4	1	1.6	0.26
Night waking with wheeze	2.2	1.7	2.4	0.28
If yes, happened in the past 12 months	1.0	0.3	1.4	0.02
If yes, happened at least once a months	1.7	0.3	1.0	0.08
Night waking with cough	3.8	4	3.7	0.74
If yes, happened in the past 12 months	1.3	0.6	1.7	0.03
If yes, happened at least once a months	1.2	0.6	1.6	0.05
Severe wheeze	1.4	0.8	1.8	0.1
If yes, happened in the past 12 months	0.5	0.3	0.6	0.5
If yes, happened at least once a months	0.5	0.3	0.6	0.5

* There are 9 school children who did not answer the question about gender.

* Missing information varied between 9 and 15 for each of the questions.

Table 4. Asthma symptoms by county (ISAAC Video Questionnaire) among 12-14 year old school children living in rural Tibet

	Total (n=2026) %	Tingri (n=1001) %	Sagya (n=1025) %	P-value
Wheeze at rest	2.8	1.3	4.3	<0.01
If yes, happened in the past 12 months	1.1	0.9	1.3	0.42
If yes, happened at least once a months	0.8	0.4	1.3	0.03
Wheeze after exercise	4.1	2.3	5.9	<0.01
If yes, happened in the past 12 months	1.4	1.2	1.7	0.38
If yes, happened at least once a months	1.4	1.3	1.5	0.74
Night waking with wheeze	2.2	1.8	2.5	0.25
If yes, happened in the past 12 months	1.0	1.1	0.9	0.62
If yes, happened at least once a months	1.7	0.9	0.6	0.42
Night waking with cough	3.8	2.0	5.5	<0.01
If yes, happened in the past 12 months	1.3	1.1	1.5	0.46
If yes, happened at least once a months	1.2	0.9	1.6	0.18
Severe wheeze	1.4	0.8	2.0	0.02
If yes, happened in the past 12 months	0.5	0.2	0.8	0.12
If yes, happened at least once a months	0.5	0.2	0.8	0.12

*Missing information varied between 3 and 7 for each of the questions.

Table 5. Description of household smoking habits by county among 12-14 year old school children living in rural Tibet

	Total (n=2026) %	Tingri (n=1001) %	Sagya (n=1025) %	P-value
Does your mother smoke				
Formerly	3.6	3.9	3.2	0.42
Currently	3.4	3.5	3.3	0.84
Does your father smoke				
Formerly	36.5	36.2	36.9	0.65
Currently	35.3	36	34.6	0.61
Anyone smoke inside your home	56.4	53.3	59.4	<0.01
If yes, how many cigarettes in total per day in the past				<0.01
<10 cigarettes	35.1	29.9	40.2	
10-20 cigarettes	16	18.2	13.9	
>20 cigarettes	5	4.9	5.2	
If yes, how many cigarettes in total per day at present				0.01
<10 cigarettes	32.8	28.5	37	
10-20 cigarettes	17.3	18.5	16.1	
>20 cigarettes	6	5.9	6.1	

*Missing information varied between 5 and 14 for each of the questions.

Table 6. Description of sources of cooking by county among 12-14 year old school children living in rural Tibet

	Total (n=2026) %	Tingri (n=1001) %	Sagya (n=1025) %	P-value
Electricity for cooking	7	8.5	5.6	0.01
Gas for cooking	4.8	4.5	5.2	0.45
Coal for cooking	1.3	2.1	0.5	<0.01
Kerosene or petrol for cooking	2	2.1	1.9	0.72
Wood for cooking	81.6	85.9	77.4	<0.01
Yak or sheep dung for cooking	37.9	31.7	44	<0.01
Others for cooking	1.6	1.4	1.9	0.4

*Missing information varied between 5 and 14 for each of the questions.

Table 7. Description of sources of heating by county among 12-14 year old school children living in rural Tibet

	Total (n=2026) %	Tingri (n=1001) %	Sagya (n=1025) %	P-value
Electricity for heating	5.2	4.9	5.6	0.46
Gas for heating	1	0.9	1.2	0.53
Coal for heating	0.9	1.1	0.8	0.48
Kerosene or petrol for heating	1.5	1.4	1.6	0.73
Wood for heating	86.9	89.1	83	<0.01
Yak or sheep dung for heating	19.5	19.4	19.6	0.78
No heating	3.2	2.9	3.4	0.47
Others for heating	0.8	1.1	0.6	0.22

*Missing information varied between 5 and 14 for each of the questions.

Table 8. Description of pets inside the home by county among 12-14 year old school children living in rural Tibet

	Total (n=2026) %	Tingri (n=1001) %	Sagya (n=1025) %	P-value
Keep dog inside the home	65.3	80.1	50.8	<0.01
Keep cat inside the home	54.9	57.5	52.4	0.03
Keep bird and chicken inside the home	20.7	14.4	26.9	<0.01
Keep rabbit inside the home	3.1	2.3	3.8	0.05
Keep other animal inside the home	22.4	18.8	35.9	<0.01
No pets inside the home	12.7	5.5	19.8	<0.01

*Missing information varied between 10 and 32 for each of the questions.

Table 9. Description of pets and farm animal outside home by county among 12-14 year old school children living in rural Tibet

	Total (n=2026) %	Tingri (n=707) %	Sagya (n=1310) %	P-value
Contact dog at least once a week	40.8	45.9	35.9	<0.01
Contact cat at least once a week	36.4	33.1	39.6	<0.01
Contact farm animals at least once a week	24.7	20.7	28.6	<0.01
Contact other animals at least once a week	6.3	2.5	10	<0.01

*Missing information varied between 10 and 32 for each of the questions.

Table 10. Description of dampness and molds by county among 12-14 year old school children living in rural Tibet

	Total (n=2026) %	Tingri (n=707) %	Sagya (n=1310) %	P-value
Dampness on the walls or ceiling	12.6	11.5	13.7	0.14
Molds on the walls or ceiling	14.3	12.9	15.6	0.08
Dampness/molds	23.8	21.0	26.6	<0.01

*Missing information varied between 1 and 3 for each of the questions.

Table 11. Number of siblings by county among 12-14 year old school children living in rural Tibet

	Total (n=2026) %	Tingri (n=1001) %	Sagya (n=1025) %
0	3.6	4.3	2.8
1 sibling	13.5	11.2	15.7
2 siblings	18.1	16.5	19.7
3 siblings	18.1	19.1	17.1
4 siblings	14.8	16.1	13.6
5 siblings or more	31.7	32.9	30.6

*Missing information varied between 3 and 54 for each of the questions.

Table 12. Bivariate associations between respiratory symptoms of asthma (Video) and household smoking habits and dampness/molds among 12-14 year old school children living in rural Tibet

				Wheeze at rest			Wheeze after exercise			Night waking with wheeze			Night waking with cough			Severe wheeze		
			N	%	OR	95%CI	%	OR	95%CI	%	OR	95%CI	%	OR	95%CI	%	OR	95%CI
Smoking Habits	Mother	Yes	69	4.3	1.6	0.5-5.3	2.9	0.6	0.2-2.9	4.3	2.2	0.7-7.2	7.2	2.1	0.8-5.3	5.8	5.0	1.7-14.7
		No	1950	2.7			4.1			2.1			3.6			1.2		
	Father	Yes	714	2.1	0.7	0.4-1.2	3.5	0.8	0.5-1.3	2.0	0.9	0.5-1.7	3.2	0.8	0.5-1.3	1.4	1.0	0.5-2.2
		No	1303	3.1			4.4			2.2			4.1			1.4		
	Others	Yes	1141	2.6	1.1	0.6-1.9	3.9	1.0	0.7-1.6	2.5	0.6	0.3-1.2	4.0	0.8	0.5-1.4	1.3	1.1	0.5-2.4
		No	874	2.9			4.1			1.6			3.4			1.5		
Dampness/ Molds	Dampness	Yes	255	7.1	3.4	1.9-6.0	7.5	2.1	1.3-3.6	2.4	1.1	0.5-2.6	8.2	2.8	1.7-4.7	2.4	1.8	0.7-4.5
		No	1768	2.2			3.6			2.2			3.1			1.3		
	Molds	Yes	289	3.8	1.5	0.8-2.9	6.6	1.9	1.1-3.2	4.5	2.6	1.3-5.0	8.3	2.9	1.8-4.8	3.5	3.4	1.6-7.5
		No	1732	2.6			3.6			1.8			3.0			1.0		
	Dampness/Molds	Yes	482	4.8	2.2	1.3-3.8	5.4	1.5	0.9-2.4	3.5	2.0	1.1-3.9	6.0	2.0	1.3-3.3	2.7	2.6	1.3-5.5
		No	1540	2.2			3.7			1.8			3.0			1.0		

OR, odd ratio; CI, confidence interval.

Table 13. Bivariate associations between respiratory symptoms of asthma (Video) and cooking and heating condition and pets among 12-14 year old school children living in rural Tibet

			Wheeze at rest			Wheeze after exercise			Night waking with wheeze			Night waking with cough			Severe wheeze		
		N	%	OR	95%CI	%	OR	95%CI	%	OR	95%CI	%	OR	95%CI	%	OR	95%CI
Cooking	Modern	122	4.1	0.7	0.3-1.7	3.3	1.3	0.5-3.5	3.3	0.6	0.2-1.8	5.7	0.6	0.3-1.4	3.3	0.4	0.1-1.2
	Traditional	1894	2.7			4.1			2.1			3.6			1.3		
Heating	Modern	86	2.3	1.2	0.3-5.1	1.2	3.6	0.5-26.2	1.2	1.9	0.3-13.9	4.7	0.8	0.3-2.2	4.7	0.3	0.1-0.8
	Traditional	1925	2.8			4.2			2.2			3.7			1.2		
Pets	Yes	1794	2.6	0.6	0.3-1.1	3.7	0.5	0.3-0.9	2.1	0.9	0.4-2.4	3.6	0.7	0.4-1.4	1.3	0.7	0.3-2.1
	No	221	4.5			6.8			2.3			5.0			1.8		

OR, odd ratio; CI, confidence interval.

Modern cooking and heating including electricity, gas, coal and kerosene.
Traditional cooking and heating including wood and yak/sheep dung.
Pets including dogs, cats, birds, rabbits and others inside the house.

Table 14. Bivariate associations between respiratory symptoms of asthma (Video) and number of siblings among 12-14 year old school children living in rural Tibet

		Wheeze at rest			Wheeze after exercise			Night waking with wheeze			Night waking with cough			Severe wheeze		
	N	%	OR	95%CI	%	OR	95%CI	%	OR	95%CI	%	OR	95%CI	%	OR	95%CI
No sibling	72	1.4			2.8			1.4			0.0			1.4		
1-2 siblings	640	2.5	1.4	0.2-10.9	4.7	1.3	0.3-5.7	2.0	1.0	0.1-7.8	3.4	131	0.0-4.5E+08	1.1	0.6	0.1-5.4
3-4 siblings	665	2.6	1.8	0.2-13.4	3.2	1.2	0.3-5.3	2.7	2.0	0.3-14.9	3.9	155	0.0-5.3E+08	1.4	1.0	0.1-7.7
5 or more siblings	642	3.3	1.9	0.3-14.6	4.4	1.3	0.3-5.4	1.9	1.2	0.2-9.1	4.4	153	0.0-5.3E+08	1.7	1.0	0.1-7.2

OR, odd ratio; CI, confidence interval.

Table 15. Adjusted odds ratios and 95% confidence intervals of respiratory symptoms of asthma (video) associated with indoor condition among 12-14 year old school children living in rural Tibet

			Wheeze at rest		Wheeze after exercise		Night waking with wheeze		Night waking with cough		Severe wheeze	
			OR	95%CI	OR	95%CI	OR	95%CI	OR	95%CI	OR	95%CI
Smoking	Mother	Yes	2.2	0.6-7.9	0.8	0.2-3.6	2.5	0.7-8.9	2.2	0.8-6.1	3.7	1.1-13.0
		No										
	Father	Yes	0.6	0.3-1.1	0.8	0.5-1.3	0.8	0.4-1.6	0.7	0.4-1.2	0.9	0.4-2.0
		No										
Cooking		Modern	0.4	0.1-1.3	0.7	0.2-2.1	0.4	0.1-1.2	0.5	0.2-1.4	0.6	0.1-3.0
		Traditional										
Heating		Modern	3.1	0.6-17.1	5.1	0.6-42.4	4.9	0.5-45.9	1.6	0.4-5.7	0.5	0.1-3.7
		Traditional										
Dampness/moulds		Yes	2.1	1.2-3.7	1.4	0.9-2.3	2	1.1-3.8	2	1.2-3.3	2.3	1.0-5.2
		No										
Pets		Yes	0.6	0.3-1.3	0.6	0.3-1.1	0.9	0.3-2.4	0.7	0.4-1.5	0.6	0.2-1.9
		No										

Adjusted effects are controlled for age, sex, place and all the other covariates. OR, odd ratio; CI, confidence interval.

Modern cooking and heating including electricity, gas, coal and kerosene.

Traditional cooking and heating including wood and yak/sheep dung. Pets including dogs, cats, birds, rabbits and others inside the house.

CHAPTER IV

DISCUSSION AND CONCLUSIONS

IV. Discussion and conclusions

This study describes the prevalence of respiratory symptoms of asthma, rhinitis and eczema and the symptoms associated with indoor conditions and lifestyle among 12-14 year old children living in rural districts of Tibet. The knowledge about childhood asthma, rhinitis and eczema is limited in Tibet, especially in the rural areas. In 2000, a smaller study was conducted in the capital of Tibet. The prevalence of asthma was reported to be 0.5%. However, there is limited information available about the methods that were applied. The present study is the first epidemiological survey on self-reported asthma symptoms in rural districts of Tibet. By applying the standardized ISAAC protocol, symptoms suggestive of asthma were assessed, and thus it was possible to compare the prevalence of asthma, asthma symptoms, rhinitis and eczema in this sample with prevalences from other populations.

Most of the respondents in this study seemed to have understood the questions and had filled in their answers correctly. Despite the use of standard simple questionnaires, validated study protocols, and careful translation of the questionnaire, cultural and language differences could still have influenced the results. A study comparing results from the written questionnaire and the video questionnaire in English and non-English speaking countries found that the results showed different patterns, suggesting that language factors could have led to differences in the assessment of symptom prevalence (ISAAC Steering Committee, 1998). The agreement between the responses to the written and the video questionnaire seemed to be higher for English-speaking countries compared with non-English speaking countries. Chinese studies showed lower levels of agreement than English and Spanish studies, and Russian studies showed the lowest level of agreement (Crane J, 2003). This study also showed low agreement between the written questionnaire and the video questionnaire. Positive responses to the video questionnaire were generally lower than for similar questions in the written questionnaire, this has been observed in many ISAAC studies. This is probably caused by the fact that the symptoms presented in the video were rather severe, and that some children were likely to have experienced only milder symptoms. However, some children answered yes to symptoms in the video questionnaire and no to questions about these symptoms in the written questionnaire. This could indicate that the translation of these symptoms is not

straightforward. The Tibetan language has for instance no colloquial terms for symptoms such as wheezing. This problem is not unique for the Tibetan language and one should have that in mind when comparing results from the video questionnaire and the written questionnaire and in comparisons between countries. It may be that showing rather than asking about the signs and symptoms of asthma is a more valid way of providing information suitable for comparisons between populations. Prevalence of asthma symptoms was somewhat different in Tingri and Sagya. This was clearly the case for symptoms based on the questionnaire, but to some extent also for the video questionnaire. It is no good explanation for these differences since ethnicity, environmental exposure, diet and socio-economic conditions were quite similar in both counties. It could be a chance finding. It is also possible that the more central location of Sagya compared to Tingri could reflect some unknown difference in exposure even if ethnicity, environmental exposure, diet and socio-economic conditions were quite similar in both counties.

In order to recruit a representative population of school children from the high altitude rural parts of Shigatze District, children were recruited from rural schools situated at altitudes higher than 3900 meters above sea level. None of the invited children refused to participate. As it turned out, more boys than girls were included in the study. This was expected, as more boys than girls attend school in these counties (Tingri and Sagya Education Office, 2004). The reason for this is a cultural and not a medical issue. It is not believed that girls that do not attend school are more or less ill than those that attend school. The main reason for keeping girls at home is that it is not considered necessary that girl get education and that they should help in house work and farm work before they get married. The finding that boys have more respiratory symptoms than girls is a common finding all over the world. This supports the view that the girls' health is not a selection criterion for school attendance in Tibet.

The self-reported prevalence of asthma was 2.4%. This is much lower than reported in the UK (29%), Australia (30%), New Zealand (30%) and USA (21%) and more similar to those found in regional countries like India (7%) and China (4%) (ISAAC Steering Committee, 1998). Using the ISAAC video questionnaire, asthma symptoms in the rural district of Tibet were much lower than in for instance Australia (17.6% wheeze at rest, 27.2% wheeze after exercise, 11.0% night waking with wheeze, 18.7% night waking with cough, and 11.3% severe wheeze), New Zealand (18.4% wheeze at rest, 30.3% wheeze

after exercise, 11.7% night waking with wheeze, 22.8% night waking with cough, and 12.4% severe wheeze), USA (13.0% wheeze at rest, 22.5% wheeze after exercise, 4.6% night waking with wheeze, 13.5% night waking with cough, and 10.6% severe wheeze) (ISAAC Steering Committee, 1998), and Hong Kong (7.0% wheeze at rest, 6.4% wheeze after exercise, 1.9% night waking with wheeze, 22.6% night waking with cough, and 6.2% severe wheeze) (Wong GW, 2004). The findings were more in accordance with findings from India (2.9% wheeze at rest, 5.5% wheeze after exercise, 2.3% night waking with wheeze, 3.7% night waking with cough, and 2.5% severe wheeze), China (2.0% wheeze at rest, 5.1% wheeze after exercise, 0.6% night waking with wheeze, 4.9% night waking with cough, and 1.2% severe wheeze), Indonesia (1.3% wheeze at rest, 2.8% wheeze after exercise, 0.6% night waking with wheeze, 1.8% night waking with cough, and 0.8% severe wheeze) and Russia (1.3% wheeze at rest, 1.9% wheeze after exercise, 0.8% night waking with wheeze, 1.1% night waking with cough, and 0.3% severe wheeze) (ISAAC Steering Committee, 1998). In general, higher prevalence rates have been found among children from "westernized" countries than in developing countries in Asia. The figures from Tibet fit well into this picture. It further emphasizes the need to understand why "westernization" or "urbanization" seems to have negative effects on children's respiratory health, the reasons for which so far remain mostly unknown. Some researchers have argued that mycobacterium tuberculosis infections are protective of the development of asthma (Hassan MR, 2002). As tuberculosis is a common infection among Tibetan children (U.S. Embassy Beijing, 2000), one could speculate that this could have contributed to the low symptom prevalence among Tibetan children.

In the present study I have studied associations between asthma symptoms and several exposures and living conditions that have been addressed by other asthma researchers. Current and past exposures to environmental exposures were highly correlated and there were no signs of changes in exposure due to diseases development or awareness of health consequences. We have therefore only presented results of analyses of current exposures.

Most of the children were exposed to traditional sources of energy for cooking and heating. This clearly indicates that most of the children are heavily exposed to particles indoors, a type of exposure that has been suggested to cause harmful health effects. As most of the children were exposed, it was rather unlikely that this study could show that these exposures were associated with negative health effects. However, it is interesting

that a population with a high and uniform exposure to particles, which is considered by many to be harmful to children's health, reports such low levels of asthma related symptoms. However it is still possible that exposure to particles could have caused symptoms like coughing.

The data shows that most children were regularly exposed to animals at home and/or outside home. As for traditional heating and cooking it reduced the chance of studying exposure to animal dander allergens as risk factors of asthma symptoms.

Smoking habits have not been assessed before in this part of the world. I report that a substantial part of the fathers were smokers, while maternal smoking was rare. This finding shows that smoking related diseases like lung cancer are or will be common in the male population of Tibet. There were no indications of health consequences of paternal smoking in the children. The high levels of particles in indoor air from heating and cooking with dung and/or wood could have reduced the chance to find specific and separate effects of passive smoking. Maternal smoking was rare. Even so, there was a tendency that asthma symptoms were more common in children exposed to maternal smoking. Since no effect was seen from paternal smoking, one could speculate that maternal smoking causes this tendency in pregnancy.

Several studies have shown that having many siblings reduces the risk of developing asthma and allergies (Ponsonby AL, 1998). The present study did not confirm these findings. Even if many families were quite large the analyses showed a trend of increasing symptoms with that of increasing family size. However, these findings did not reach statistical significance.

Exposure to dampness and molds has been found to be associated with respiratory symptoms of asthma in many studies. This was also the case in rural Tibet. A study from Stockholm Sweden found a relationship between self-reported building dampness and asthma symptoms (OR, 2.8; 95%CI, 2.7 to 3.0) and current coughing (OR, 5.3; 95% CI, 5.0 to 5.6) (Engvall K, 2001). Another study reported that children living in homes with mold odor at baseline had >100% increased the risk of developing asthma (Jaakkola JJ, 2005). Still we do not know why dampness/mold exposure increases the risk of asthma and asthma related symptoms and further studies are need to look into the details of

dampness/molds for the development of asthma also in Tibet.

Conclusions

This is the first report of the childhood asthma and asthma related symptoms in rural Tibet. Based on the standardized and validated ISAAC questionnaire, Tibetan children living in rural districts have asthma and asthma related symptoms rates that are similar to several neighbor countries, including India, China and Russia. Disease and symptom occurrence are clearly lower than findings from most western countries including Australia, New Zealand and USA. The causes of the low prevalence are not clear, but the present findings fit well with the common belief that there is something about the western lifestyle that is unfavorable for asthma and asthma related symptoms. The study did not directly identify causes of asthma or symptoms of asthma or asthma related diseases as rhinitis and eczema. However, genetic/ethnical factors, little use of medicine such as antibiotics, altitude and even emotional/culture issues could have contributed to the low disease rates. The finding of a potential effect of maternal smoking and a significant relation between indoor exposure to dampness/molds and asthma symptoms is interesting. The findings are supported by several studies form other parts of the world. Most of the children in the present study were probably heavily exposed to traditional sources of energy for cooking and heating and to animal allergens. This makes it difficult to show that these exposures were associated with asthma and asthma related symptoms in this population. However, it is interesting that a probably heavily exposed population has that low disease and symptom prevalences. Further studies are necessary to reveal the reasons for the low occurrence of asthma and allergy related diseases and symptoms in rural Tibet and why disease and symptom occurrence are much lower than in most western countries.

CHAPTER V

REFERENCES

V. References

Asthma and schools 2004
URL:http://www.asthmaandschools.org/essentials/glossary.htm

Åberg N, Hasselmar B, Åberg B, Eriksson B. Increase of asthma, allergic rhinitis and eczema in Swedish school children between 1979 and 1991. *Clin Exp Allergy* 1995;21:815-819.

Anderson HR, Strachan DP, Burr M, Standring P, Steriu A, Goulding R. Trends in prevalence of symptoms of asthma, hay fever, and eczema in 12-14 year olds in the British Isles, 1995-2002: questionnaire survey. *BMJ* 2004;328 (7447):1052–1053.

Australian Government Initiative 2005
URL:http://www.healthinsite.gov.au/topics/Astham

Ait-Khaled N, Enarson DA, Bousquet J. Chronic respiratory diseases in developing countries: the burden and strategies for prevention and management. *Bull World Health Organ* 2001;79:971-979.

Ait-Khaled N, Enarson DA. Management of asthma in adults. *IUATLD* 1996; 7: 1, 5.

A world wide problem---Asthma. *IUATLD* 2004
URL: http://www.iuatld.org/pdf/en/fichesasthma.pdf

Braun-Fahrländer C. Commentary: Does the "hygiene hypothesis" provide an explanation for the relatively low prevalence of asthma in Bangladesh? *Int J Epidemiol* 2002;31:488-489.

Bousquet J, Ansotegui IJ, van Ree R, Burney PG, Zuberbier T, Van Cauwenberge P. European Union meets the challenge of the growing importance of allergy and asthma in Europe Allergy 2004. *Blackwell Munksgaard* 2004;59:1–4.

Cook DG, Strachan DP. Parental smoking, bronchial reactivity and peak flow variability

in children. *Thorax* 1998;53:295–301.

Crane J, Mallol J, Beasley R, Stewart A, Asher MI. Agreement between written and video questions for comparing asthma symptoms in ISAAC. *Eur Respir J* 2003;21:455-461.

Chinese News Center. The Prevalence of Asthma in China. 2002
URL: http://www.chinagateway.com.cn/chinese/zhuanti/5585.htm

Clark PS. Emotional exacerbations in asthma caused by over-breathing. *J Asthma* 1982;19:249-251.

Chen YZ. A nationwide survey in China on prevalence of asthma in urban children. *Chin J Pediatr* 2003; 41(2):123-127.

Engvall K, Norrby C, Norback D. Asthma symptoms in relation to building dampness and odour in older multifamily houses in Stockholm. *Int J Tuberc Lung Dis* 2001; 5 (5): 468-477.

Ellwood P, Asher MI and the ISAAC phase one study group. Diet and asthma, allergic rhinoconjunctivitis and atopic eczema symptom prevalence: an ecological analysis of the International Study of Asthma and Allergies in Childhood (ISAAC) data. *Eur Respir J* 2001;17:436-443.

Farchi S, Forastiere F, Agabiti N, Corbo G, Pistelli R, Fortesz C, Dell'Orco V, Perucci CA. Dietary factors associated with wheezing and allergic rhinitis in children. *Eur Respir J* 2003;22:772–780.

General Introduction of Tibet 2004
URL:http://www.linktrip.com/tibet/general/intro.htm

GINA new report (2003)---5% people all over the world struggle with asthma
URL: http://www.asthmachina.com/news/22.htm

Garfunkel J. About Tibet Education. 1999

URL: http://www.globalsourcenetwork.org/tibet.htm

Hölscher B, Frye C, Wichmann HE, Heinrich J. Exposure to pets and allergies in children. *Pediatr Allergy Immunol* 2002;13:334–341.

Hessen JO, Schei MA, Smith KR. Prevalence and risk factors for asthma in Nepal. *Epidemiol* 2003;14(5):123.

Hassan MR, Kabir ARML, Mahmud AM, Rahman F er al. Self-reported asthma symptoms in children and adults of Bangladesh: findings of the National Asthma Prevalence Study. *Int J Epidemiol* 2002;31:483-488.

Health Scout-Health Library---Asthma in children 2004
URL:http://www.healthscout.com/template.asp?page=ency&ap=1&encyid=383

Harty SB, Sheridan A, Howell F, Nicholson A. Wheeze, eczema and rhinitis in 6-7 year old Irish schoolchildren. *Ir Med J* 2003;96(4):102-104.

ISAAC Steering Committee. Worldwide variation in prevalence of symptoms of asthma, allergic rhinoconjunctivitis, and atopic eczema: ISAAC. *Lancet* 1998;351:1225-1232.

ISAAC Steering Committee. Worldwide variations in the prevalence of asthma symptoms: the International Study of Asthma and Allergies in Childhood (ISAAC). *Eur Respir J* 1998;12:315-335.

ISAAC (International Study of Asthma and Allergies in Childhood) introduction Tadd Clayton 2003
URL:http://isaac.auckland.ac.nz/banner1.html

ISAAC phase one video questionnaire 2004
URL:http://isaac.auckland.ac.nz/PhaseOne/Video.html

ISAAC Phase Three 2004
URL:http://isaac.aukland.ac.nz/Phasethr/Phs3Frame.html

Joonasson G, Lodrup Carlsen KC, Leegaard J, Carlsen KH, Mowinckel P, Halvorsen KS. Trends in hospital admissions for childhood asthma in Oslo, Norway, 1980-95. *Allergy* 2000;55:232-239.

Jaakkola JJ, Hwang BF, Jaakkola N. Home dampness and molds, parental atopy, and asthma in childhood: a six-year population-based cohort study. *Environ Health Perspect* 2005;113:357–361.

Kull I, Almqvist C, Lilja G, Pershagen G, Wickman M. Breast-feeding reduce the risk of asthma during the first 4 years of life. *J Allergy Clin Immunol* 2004;114:755-760.

Kishore J. A dictionary of public health. *New Delhi* 2002; p33.

Kearney PJ, Kearney PM. The prevalence of asthma in schoolboys of traveler's families. *Ir Med J* 1998;6:91.

Leffert F. The management of chronic asthma. *Pediatr J* 1980;97:875-885.

Mutius EV. The burden of childhood asthma. *Arch Dis Child* 2000;82(Suppl II):ii2-ii5.

Masoli M, Fabian D, Holt S, Beasley R. Global burden of asthma. 2003
URL:http://www.ginasthma.com/ReportItem.asp?l1=2&l2=2&intId=95

Mcglaun S. Asthma facts & figures introduction. 2003
URL:http://asthma.about.com/od/asthmanewsresearch/a/asthmafacts.htm

Map of Tibet 2005
URL: http://www.travelchinaguide.com/images/map/tibet/tibet-map.gif

Nystad W, Røysamb E, Magnus P, Tambs K, Harris JR. A comparison of genetic and environmental variance structures for asthma, hay fever and eczema with symptoms of the same diseases: a study of Norwegian twins. *Int J Epidemiol* 2005;10:1093-1101.

Ponsonby AL, Couper D, Dwyer T, Carmichael A. Cross sectional study of the relation between sibling number and asthma, hay fever, and eczema. *Arch Dis Child* 1998;79:328-333.

Pordage P. Taking the tears out of asthma. *Cambridge Consultants Ltd* 2003 URL:http://www.cambridgeconsultants.com/news_pr96.shtml

Ramsey CD, Celedón JC. The hygiene hypothesis and asthma. *Curr Opin Pulm Med* 2004;11:14–20.

Romieu I, Mannino DM, Redd SC, McGeehin MA. Dietary Intake, Physical Activity, Body Mass Index, and Childhood Asthma in the third national health and nutrition survey. *Pediatr Pulmonol* 2004;38:31-42.

Röder I. Stress in children with asthma: coping and social support in the school context. *Thesis. Leiden University, print partners Ipskamp, Enschede; Leidend* 2000; p22, 25, 27.

Russell G. Asthma-- extent of asthma in the UK 1998 URL:http://www.tiscali.co.uk/lifestyle/healthfitness/health_advice/netdoctor/archive/001044.html

Sagya Administrative News Office 2003 URL:http://www.tibet.cn/area/rkz/dqxs/200312003101692721.htm

Secondary City --- Shigatse 2004 URL:http://auto.sina.com.cn/news/2004-09-10/79389.shtml

Shigatse City Government Report 2002 URL:http://www.shigatse.gov.cn/TRAVEL/LIYANG/location.asp

Svanes C, Heinrich J, Jarvis D, Chinn S, Omenaas E, Gulsvik A, Künzli N, Burney P. Pet-keeping in childhood and adult asthma and hay fever. *Eur Commun Respir Health Survey J Allergy Clin Immunol* 2003;112:289-300.

Strachan DP, Cook DG. Parental smoking and childhood asthma: longitudinal and case-control studies. *Thorax* 1998;53:204–212.

Singh D, Sobti PC, Arora V, Soni RK. Epidemiological study of asthma in rural children. *Indi J Commun Med* 2002; XXVII, No.4, October-December.

Sheiel WC. Webster's New World™ Medical Dictionary 2nd Edition 2003
URL:http://www.medterms.com/script/main/art.asp?articlekey=32441

Strauss RH, McFadden ER Jr, Ingram RH Jr, Jaeger JJ. Enhanced of exercise-induced asthma by cold air. *N Engl J Med* 1977;297:743-747.

Thomas AE, Melody C. Asthma and indoor exposure to allergens. *N Engl J Med* 1997;336:1382-1384.

Tingri and Sagya Education Office. Education statistical table 2004

Tingri Administrative News Office 2003
URL:http://www.tibet.cn/area/rkz/dqxs/200312003101692721.htm

Tibet's economy surges in 2002 CCTV.COM 2003-01-04
URL:http://www.china-hiking.com/tibet/TibetEconomy2002.htm

Tibetan population 2001
URL:http://www.unescap.org/esid/psis/population/database/chinadata/tibet.htm

Tibet social life 2001
URL:http://www.unescap.org/esid/psis/population/database/chinadata/tibet.htm

Takemura Y, Sakurai Y, Honjo S. The relationship between fish intake and the prevalence of asthma: the tokorozawa childhood asthma and pollinosis study. *Prev Med* 2002;34:221–225.

U.S. Embassy Beijing-Health policy challenges in the Tibet Autonomous Region 2000; 12.

URL:http://www.usembassy-china.org.cn/sandt/tib-health.htm

Weinstein AG. Crying induced bronchospasm in childhood asthma. *Asthma J* 1984;21: 161-165.

World Asthma Day-Help Our Children Breathe. *WHO/92* 1998
URL:http://www. who.int/inf-pr-1998/en/pr1998-29.html

World Asthma Day- Let Every Person Breathe. *WHO/29* 2000
URL:http://www.who.int/inf-pr-2000/en/pr2000-29.html

Wong GW, Leung TF, Ko FW, Lee KK, Lam P et al. Declining asthma prevalence in Hong Kong Chinese schoolchildren. *Clin Exp Allergy* 2004;34:1550-1555.

Warner JO. The early life origins of asthma and related allergic disorders. *Arch Dis Child* 2004;89:97-102.

Wang J, Visness CM, Sampson HA. Food allergen sensitization in inner-city children with asthma. *J Allergy Clin Immunol* 2005;115(5):1076-1080.

Zhong ZW. China's Tibet. *Wuzhou Publishing Company* 2001;8:1-6.

CHAPTER VI

APPENDIX

Appendix 1

How common are asthma and respiratory symptoms among school children in Tibet?

Is it possible to reduce the occurrence of these health problems?

These are some of the questions we hope we will be *able to answer through this health* survey.

Your daughter/son/student is invited to participate in this health survey together with their classmates and children from several other schools in Tibet. With this letter we ask for permission to ask your daughter/son/student to fill in a questionnaire with questions about their health and home environment. We want to find out how common these health problems are and whether there are home environment conditions that increase children's risk of having such problems. To succeed in our aims we are dependent on participation of as many children as possible.

What does it mean for a child to participate in the survey?

The survey will take place in the children's ordinary classroom with the teacher and our researcher or research assistant present. The whole class will see a short video that shows examples of children with different airway symptoms. The children will then be asked to fill in a questionnaire if they have experienced or not experienced these symptoms themselves. The questionnaire will also include questions about other respiratory symptoms, eczema etc as well as questions about conditions at home like the number of siblings in the family, domestic animal, and pets, how the food is prepared and what they normally eat during a week.

The use of the results

The collected information will be used in planning health services, health information and for research purposes. All information will be treated confidentially and will be locked away under the control of the Medical Faculty, University of Tibet. You and your child have the right to ask for destruction of the information related to your child at any time. After the research team has left the village you have to contact the Dean of the Medical Faculty in Lhasa, if you want the information destroyed. Your son/daughter/student's schoolteacher will eventually forward such message from you to the Dean. The questionnaires will not be stored with your child/student's name or date of birth, but only

with a number. The number will be unique for your child and the Dean at the Medical Faculty will be the only person that will be able to link information from the questionnaire with the personal information.

Participation in the survey is voluntary.

However, we hope that you will give your consent to let your child participate. A high participation rate will ensure that we will get the most correct picture of Tibetan children's health and of conditions that may affect children's health.

Who is responsible for the survey?

The survey is carried out by the Medical Faculty, The University of Tibet as the responsible institution in cooperation with Peoples I. Hospital, Lhasa, and the University of Oslo, Norway.

For your information:

- All persons involved in this health survey have the duty of confidentiality and no one else will be able to view any information about your child.
- Results from this study will only be used in planning of health services for children in Tibet and for research purposes.
- It is totally up to you whether you want your child to participate in this health survey or not, but we would appreciate participation from as many children as possible

Yours Sincerely,

(Name and signature)……..Dean, Medical College, Tibet University

I /We agree that our daughter/son/student_____ can participate in the health survey and confirm that we have read the information and are informed about the purposes of the survey.

…….. (Signature)

Appendix 2

Questionnaire (Childhood Asthma in Tibet)

No.???????

Date of answering the questionnaires: / /2004

Part A

Core questionnaire for demographic characteristics

Name of school:
Name of Village and Town:
Name of County:
Name of District:

1. Middle school?1 Primary school?2

2. ____ Class ____ Grade

3. Are you a boy or girl? Boy?1 Girl?2

4. How old are you?___ Years old

5. How many brothers do you have?
Older brothers
Younger brothers

6. How many of your older brothers are dead?

Which of the following reasons caused his death?
1.Drowning 2. Pneumonia 3.Tuberculosis 4.Traffic Accident 5.Trauma
6. Get an electric shock 7. Pesticide poisoning 8. Cardiopathy 9.Others

7. How many of your younger brothers are dead?

Which of the following reasons caused his death?
1.Drowning 2. Pneumonia 3.Tuberculosis 4.Traffic Accident 5.Trauma
6. Get an electric shock 7. Pesticide poisoning 8. Cardiopathy 9.Others

8. How many sisters do you have?
Older sisters
Younger sisters

9. How many of your older sisters are dead?

Which of the following reasons caused her death?
1.Drowning 2. Pneumonia 3.Tuberculosis 4.Traffic Accident 5.Trauma

6. Get an electric shock 7. Pesticide poisoning 8. Cardiopathy 9.Others

10. How many of your younger sisters are dead?

Which of the following reasons caused her death?
1.Drowning 2. Pneumonia 3.Tuberculosis 4.Traffic Accident 5.Trauma
6. Get an electric shock 7. Pesticide poisoning 8. Cardiopathy 9.Others

11. How many animals does your family own?
Yak(male)
Yak(female)
Zho[1]
[1] The sterile hybrid; offspring of a Bull and a female Yak.
Sheep
Goat
Horse
Dnkey
Mule
Cow
Pig
Chicken
Duck
Goose

12. How much land does your family own?_____A unit of area

13. How is your family financial condition (income) compare to other families?
Poor?1 Quiet rich ?2 Very rich?3

14. Where were you born in Tibet?
Lhasa?1 Shigatse?2 Nyingchi?3 Lhoka ?4 Chamdo?5
Nagchu?6 Ngari?7 Others___ 8

15. What ethnic group do you belong to?
Tibetan?1 Han Chinese?2 Han Moslem?3 Tibetan Moslem?4
Others_____ 5

16. What language do you speak mainly in your family?
Tibetan?1 Chinese?2 Tibetan and Chinese?3 Others__4

17. Do you know anything about ASTHMA?
Yes?1 No?2

If yes, how did you know it?
(Please tick all that apply)

Yes?1 No?2

From your parent

From your sisters or brothers

From your friends

From your teachers

From books / newspapers

From radio / TV

Others

Part B

Video questionnaire

18. Has your breathing ever been like this at any time in your life?

Yes?1 No?2

If yes, has this happened in the past 12 months? Yes?1 No?2

If yes, has this happened at least once a month? Yes?1 No?2

19. Has your breathing been like the boy's in the dark shirt following exercise at any time in your life? Yes?1 No?2

If yes, has this happened in the past 12 months? Yes?1 No?2

If yes, has this happened at least once a month? Yes?1 No?2

20. Have you been woken at night like this at any time in your life?

Yes?1 No?2

If yes, has this happened in the past 12 months? Yes?1 No?2

If yes, has this happened at least once a month? Yes?1 No?2

21. Have you been woken at night like this at any time in your life?

Yes?1 No?2

If yes, has this happened in the past 12 months? Yes?1 No?2

If yes, has this happened at least once a month? Yes?1 No?2

22. Has your breathing ever been like this at any time in your life?

Yes?1 No?2

If yes, has this happened in the past 12 months? Yes?1 No?2

If yes, has this happened at least once a month? Yes?1 No?2

Part C

Core questionnaire for wheezing and asthma

23. Have you ever had wheezing or whistling in the chest at any time in the past?

Yes?1 No?2

If you have answered 'NO', please jump to question 29.

24. Have you had wheezing or whistling in the chest in the past 12 months?

Yes?1 No?2

If you have answered 'NO', please jump to question 29.

25. How many attacks of wheezing have you had in the past 12 months?

None?1 1 to 3?2 4 to 12?3 More than 12?4

26. In the past 12 months, how often, on average, has your sleep been disturbed due to wheezing?

Never woken with wheezing?1 Less than one night per week?2

One or more nights per week?3

27. In the past 12 months, has wheezing ever been severe enough to limit your speech to only one or two words at a time between breathes?

Yes?1 No?2

28. In the past 12 months, what have made your wheezing worse?

(Please tick all that apply)

Yes?1 No?2

Weather

Pollen

Emotion

Fumes

Dust

Pets

Wool clothing

Colds or 'flu

Cigarette smoke

Food or drinks

Soaps, sprays or
Detergents

Drug (Aspirin)

Others (please list below)

29. Have you ever had asthma?

Yes?1 No?2

30. In the past 12 months, has your chest sounded wheezy during or after exercise?

Yes?1 No?2

31. In the past 12 months, have you had a dry cough at night, apart from a cough associated with a cold or chest infection?

Yes?1 No?2

Part D

Core questionnaire for rhinitis

All questions are about problems which occur when you DO NOT have a cold or the 'flu.

32.Do you have snivel custom in your life?

Yes?1 No?2

In the past
At present

33. Have you ever had a problem with sneezing or a runny or blocked nose, when you DID NOT have a cold or the 'flu?

Yes?1 No?2

If you have answered 'NO', please jump to question 38.

34. In the past 12 months, have you had a problem with sneezing or a runny or blocked nose when you DID NOT have a cold or the 'flu?

Yes?1 No?2

If you have answered 'NO', please jump to question 38.

35. In the past 12 months, has this nose problem been accompanied by itchy-watery eyes?

Yes?1 No?2

36. In which of the past 12 months did this nose problem occur?
(Please tick all that apply)

January?1 February?2 March?3 April?4 May?5 June?6
July?7 August?8 October?9 September?10 November?11
December?12

37. In the past 12 months, how much did this nose problem interfere with you daily activities?

Not at all?1 A little?2 A moderate amount?3 A lot?4

38. Have you ever had hay fever?

Yes?1 No?2

Part E

Core questionnaire for eczema

39. Have you ever had an itchy rash that was coming and going for at least six months?

Yes?1 No?2

If you have answered 'NO', please jump to question 45.

40. Have you had this itchy rash at any time in the past 12 months?

Yes?1 No?2

If you have answered 'NO', please jump to question 45.

41. Has this itchy rash at any time affected any of the following places:
the folds of the elbows, behind the knees, in front of the ankles,
under the buttocks, of around the neck, ears or eyes?

Yes?1 No?2

42. Has this rash cleared completely at any time during the past 12 months?

Yes?1 No?2

43. In the past 12 months, how often, on average, have you been kept awake at night by this itchy rash?

Never in the last 12 months?1 Less than one night per week?2
One or more nights per week?3

44. At what age did this itchy rash first occur?

Under 2 years?1 Age 2-4 years?2 Age 5 or more?3

45. Have you ever had eczema?

Yes?1 No?2

46.Have you ever had rhinitis?

Yes?1 No?2

Part F

Cough and phlegm

47.In the past 12 months, have you usually seemed congested in the chest or coughed up phlegm (mucus) with colds?

Yes?1 No?2

48.In the past 12 months, have you usually seemed congested in the chest or coughed up phlegm (mucus) when you did not have a cold?

Yes?1 No?2

If you have answered 'NO' to both of these questions, please jump over questions 49 and 50.

49.Do you seem congested in the chest or cough up phlegm (mucus) on most days (4 or more days a week) for as much as 3 months of the year?

Yes?1 No?2

If you have answered 'NO', please jump over question 50.

50. For how many years have this happened? _____ Years

Part G

Core questionnaire for your living (environment)

51. Do or did you share the bedroom with other people?

Yes?1 No?2

In the past

At present

With how many people did you share the bedroom?

With how many people do you share the bedroom?

52. Which of the following pets do or did you keep inside your home? (Please tick all that apply)

Dog1 Cat2 Bird3 Rabbit4 Other animal5 No pets6

In the past

At present

53. Do or did you have at least once a week contact with any of the following animals outside your home? (Please tick all that apply)

Dog1 Cat2 Farm animals (cow, sheep, goat, horse)3 Other animals4

In the past

At present

54. Does your mother smoke?

Yes?1 No?2

Formerly

Currently

55. Does your father smoke?

Yes?1 No?2

Never

Formerly

Currently

56. Has anyone smoked in the past or present inside your home?

Yes?1 No?2

If yes, how many cigarettes in total are smoked by all smokers per day in your home? (mother smokes and father smokes and other persons smoke)

Less than 10 cigarettes1 10 to 20 cigarettes2 More than 20 cigarettes3

In the past

At present

57. Which fuel do or did you use for cooking?
(Please tick all that apply)

Yes?1 No?2

Electricity In the past

At present

Gas In the past

At present

Coal In the past

At present

Kerosene In the past
Or Patrol

At present

Wood In the past

At present

Yak or In the past
Sheep dung
At present

Others

58. Which fuel do or did you use for heating?
(Please tick all that apply)

Yes?1 No?2

Electricity In the past

At present

Gas In the past

At present

Coal In the past

At present

Kerosene or In the past
Patrol
At present

Wood In the past

At present

Yak or In the past
Sheep dung
At present

No heated In the past

At present

Others

59. Does your family or parents own any of the following appliances?

Yes?1 No?2

Television

Radio

Car

Tractor

Motorcycle

Bicycle

Computer

Telephone

Mobil phone

60. How far is your home from the main road?

Less than 10m?1 11 to 30 m?2 31 to 50 m?3 50 to 100m?4
More than 100m?5

61. What kind of road is it?

Dust road?1 Concrete or cement road?2 Blacktop road?3

62. What kind of vehicle do you take from your house to school usually?

Truck?1 Tractor?2 Car?3 Motorcycle?4 Bicycle?5
Walk?6 Others?7

63. Does or did your home have damp spots on the walls or ceiling?

Yes?1 No?2

In the past

At present

64. Does or did your home have visible moulds or fungus on the walls or ceiling?

Yes?1 No?2

In the past

At present

65. What kind of floor covering is or was there in your bedroom?
(Please tick all that apply)

Yes?1 No?2

Wool carpet In the past

At present

Synthetic fiber carpet In the past

At present

Plastic carpet In the past

At present

No carpet In the past

At present

Others

66. How many windows do or did you have in your bedroom?

Yes?1 No?2

One In the past

At present

Two In the past

At present

More than two In the past

At present

No window In the past

At present

If you have answered “No window”, please jump to question 68.

67. What kind of windows is or was there in your bedroom?

Yes?1 No?2

Single glazing In the past

At present

Double glazing In the past

At present

Wood In the past

At present

Paper In the past

At present

No In the past

At present

68. What kind of pillows do or did you use?
(Please tick all that apply)

Yes?1 No?2

Foam In the past

At present

Wool In the past

At present

Feather In the past

At present

Dry grass In the past

At present

No use In the past

At present

Others

69. What kind of beddings do or did you use?
(Please tick all that apply)

Yes?1 No?2

Wool In the past

At present

Synthetic fibre In the past

At present

Feather In the past

At present

Blankets In the past

At present

Cotton In the past

At present

Other material In the past

At present

70. Outside school hours, how often do you usually exercise so much that you get out of breath or sweat?

Every day?1 4 to 6 times a week?2 2 to 3 times a week?3

Once a week?4 Once a month?5 Less than once a month?6

71. How often, on average, do you eat or drink the following, nowadays? (Please tick all that apply)

	Never?1	Less than once per week?2	1 to 2 times per week?3	3 to 6 times per week?4	Once per day or more often?5
Meat					
Fish					
Fresh fruits					
Raw green Vegetables					
Legumes (peas, beans)					
Flour					

Rice

Butter

Fizzy drinks

Potatoes

Milk

Egg

Cooked
green vegetables

Burger

Fruit juice

Nuts

Hot Pot

Instant

Noodles

Dry beef

Dry lamb

Cheese

Tsamba

Tibetan
barley beer

72. Please indicate how good your health is now:
Very good?1 Good?2 Quite good?3 Bad?4

73.Do you have any health problems?
Yes?1 No?2
If yes, please list here:

74. Are you usually feeling hungry when you go to bed at night?
Yes?1 No?2
If yes, how many times a week?
Once?1 Twice?2 Three times?3 Four to five times?4

Every night?5

Part H

Clinical examination

75. Weight (Kg):

76. Standing Height (cm):

77. Seat Height (cm):

78. Chest circumference (cm):

79. Big bone disease: No?1 Mild?2 Serious?3

80. Does she or he have any of the following skin disease or allergies? (On the face or hands)

	Yes?1	No?2
Chicken pox		
Ultraviolet radiation allergy		
Herpes simplex		
Pollen or grass allergy		
Impetigo		
Tinea unguium		
Acne		
Others		

You have now finished. Thank you very much!!!